Small Business Innovation Research/Small Business Tech Transfer

Incorporating High-Speed, Optimizing, Interleaving, Configurable/Composable Scheduling into NASA's EUROPA Planning Architecture, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Advanced, robust, autonomous planning systems have not focused on the scheduling decisions made by the planner. And high quality, optimizing schedulers have rarely been integrated with such planning systems and only at a very coarse level. Little research regarding interleaving scheduling and planning has been done. Meanwhile, we have studied and implemented human scheduling decision processes over a 20 yr. period, developing the Aurora scheduling architecture in the process, which executes very rapidly and has solved scheduling problems in dozens of diverse critical domains. We propose to intimately integrate high speed, high quality scheduling algorithms from Aurora with NASA's existing EUROPA 2 architecture and expose high level descriptions of individual scheduling decision methods to end-users, enabling users to compose and configure these scheduling methods. A combined EUROPA-Aurora system would allow for more efficient plans and more optimal scheduling. It would allow EUROPA to better handle scheduling problems in its current domains and be better applied to domains with more significant scheduling issues. Better schedules will get more science done with the same time and resources. In Phase I, we will determine the requirements of the integrated EUROPA-Aurora system for the types of domains that would most benefit from the integration and will determine additional heuristics, algorithms, methods and techniques needed for Aurora for those domains. We will develop the Integration Design, including determining, with NASA's input, whether it is most beneficial to integrate Aurora with EUROPA directly or to port algorithms from Aurora to EUROPA. We will prove feasibility of the integration by implementing an integration prototype and applying it to two different domains to show its efficacy, generality, and adaptability. Two options that we are already familiar with are planning/scheduling for ISS operations and autonomous spacecraft/robots.

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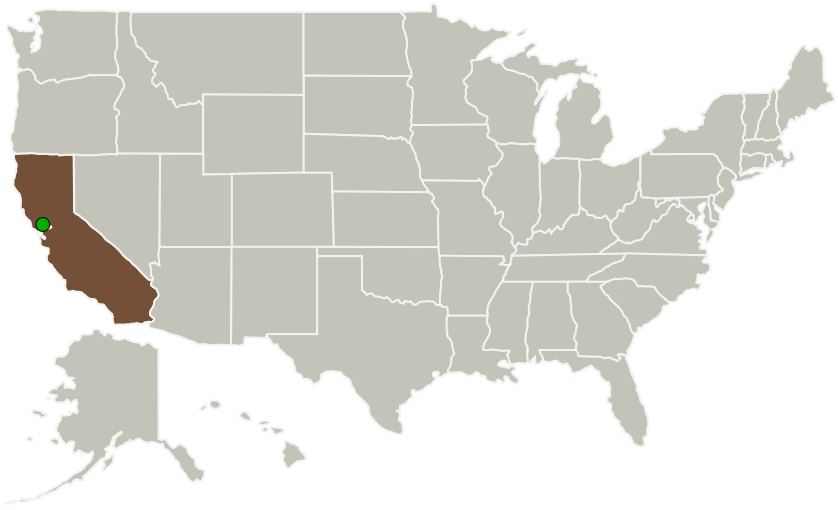
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Stottler Henke Associates, Inc.	Lead Organization	Industry	San Mateo, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Transitions

February 2011: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Stottler Henke Associates, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

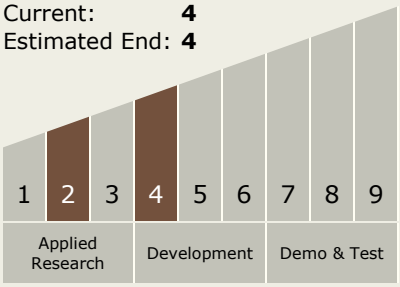
Carlos Torrez

Principal Investigator:

Richard R Stottler

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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September 2011: Closed out

Closeout Summary: Incorporating High-Speed, Optimizing, Interleaving, Configurable/Composable Scheduling into NASAs EUROPA Planning Architecture, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138640)*

Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.1 Mission Planning and Scheduling

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System